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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/828,437	04/21/2004	Shosuke Endoh	252112US2	5495

22850 7590 06/25/2009

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EXAMINER	
DHINGRA, RAKESH KUMAR	

ART UNIT	PAPER NUMBER
1792	

NOTIFICATION DATE	DELIVERY MODE
06/25/2009	ELECTRONIC

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

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Office Action Summary	Application No.	Applicant(s)	
	10/828,437	ENDOH ET AL.	
	Examiner	Art Unit	
	RAKESH K. DHINGRA	1792	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *03* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *15 April 2009*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *4-8,11,13-15 and 18-32* is/are pending in the application.

4a) Of the above claim(s) *4-7,11 and 22-27* is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *8,13-15,18-21 and 28-32* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *15 November 2006* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date *03/09,04/09*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Continued Examination Under 37 CFR 1.114

A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on 4/15/09 has been entered.

Response to Arguments

Applicant's arguments with respect to claims 8, 13-15, 18-21 and 28-31 have been considered but are moot in view of the new ground(s) of rejection as explained hereunder.

Applicant has amended claim 8 by adding new limitations like "is configured to control" and "configured to change" etc. Further, applicant has added new claim 32.

Accordingly claims 4-8, 11, 13-15 and 18-32 are pending out of which claims 8, 13-15 and 18-21, 28-32 are presently active.

New references by Masuda et al (US 2002/0005252) and Nishikawa (WO 02/065532 – corresponding to USPGPUB 2004/0099635, which is referred to hereunder) when combined with Koshiishi et al read on amended claim 8 limitations. Accordingly claims 8, 15, 18-20, 28 and 29 have been rejected under 35 USC 103 (a) as explained below. Further, remaining claims 13, 14, 21, 30-32 have also been rejected under 35 USC 103 (a) as explained below.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

Claims 8, 15, 18-20, 28 and 29 are rejected under 35 U.S.C. 103(a) as being unpatentable over Koshiishi et al (US PGPUB No. 2003/0106647) in view of Masuda et al (US 2002/0005252) and Nishikawa (WO 02/065532 – corresponding to USPGPUB 2004/0099635, which is referred to hereunder).

Regarding Claim 8: Koshiishi et al teach a plasma processing apparatus (Figures 1, 4) comprising:

A susceptor 11 having an electrostatic chuck (through dielectric films 14a, 14b) on which is mounted a wafer W that is subjected to plasma processing and a focus ring 12 having a contact surface is disposed in contact with said electrostatic chuck around a periphery of wafer W, the focus ring 12 is mounted on the electrostatic chuck having a chucking device 11a, 11b to which a DC voltage 15 is applied and the focus ring is attracted by electrostatic attraction to the electrostatic chuck by the chucking voltage applied to the chucking device 11a, 11b;

a heat exchange means provided at the said contact surface for carrying out heat exchange with the focus ring 12, the heat exchange means comprising an opening (in the dielectric layer 14b for the heat transfer gas coming through passage 17) and filled with heat transfer medium, and further comprising a supply path (connecting portion of supply path 17 to the focus ring 12) that supplies a heat transfer gas to said contact surface. Koshiishi et al further teach that for attracting the wafer and the focus ring, different voltages are applied from power supply 15 through switch 24 that is controlled by a switch controller 25 (a controller) as per sequence of plasma processing of wafer (that is supply of voltage to chucking electrode 11a, for chucking the substrate during sequences of plasma processing is controlled by a controller) [e.g. Figs.1, 4 and para. 0038, 0043, 0055-0059]. Further, claim limitation "said controller sets the chuck voltage applied to the chuck device high during at least one processing sequence" is a functional limitation, and since the structure of prior art meets the structural limitations of the claim, the same is considered capable of meeting this limitation.

In this connection the courts have ruled:

A claim containing a "recitation with respect to the manner in which a claimed apparatus is intended to be employed does not differentiate the claimed apparatus from a prior art apparatus" if the prior art apparatus teaches all the structural limitations of the claim. *Ex parte Masham*, 2 USPQ2d 1647 (Bd. Pat. App. & Inter. 1987).

Koshiishi et al do not explicitly teach the heat exchange means comprising a groove in the electrostatic chuck and a groove exposed to the contact surface and filled with a heat transfer medium, a chamber having the susceptor, and

said controller is configured to control a pressure of the heat transfer medium supplied from said heat exchange means and configured to change the pressure of the heat transfer medium supplied in accordance with each of multiple steps of the plasma process; and

the controller is configured to set the pressure of the heat transfer medium to a non-zero to a non-zero level during conveying of the object into and out of said chamber so as to carry out cooling of said focus ring during conveying the object to be processed into and out of said chamber.

Koshiishi et al teach the heat exchange means comprises an electrostatic chuck with an opening in the contact surface for the heat transfer medium to flow between the electrostatic chuck and the focus ring, but do not teach a groove exposed to the contact surface and filled with a heat transfer medium. However provision of grooves as a part of heat exchange means in electrostatic chucks is known in the art as per reference cited hereunder.

Masuda et al teach a plasma apparatus comprising a processing chamber 100 with an electrostatic chuck 131 for supporting a wafer W and where the electrostatic chuck has plurality of concentric grooves 136, 136B provided on its top surface and where groove 136B is exposed to the contact surface between the ring 132, 133 and the electrostatic chuck 131, and where the groove 136B is filled with a heat transfer gas (e.g. Fig. 1, 2 and para. 0065-0067).

Therefore it would have been obvious to one of ordinary skills in the art at the time of the invention to provide the electrostatic chuck with groove that is exposed to the contact surface as taught by Masuda et al in the apparatus of Koshiishi et al to control the heat conduction between the focus ring and the electrostatic chuck and enable keep a stable temperature of the focus ring.

Koshiishi et al do in view of Masuda et al not teach the not teach that the controller is configured to control a pressure of the heat transfer medium supplied from said heat exchange means and configured to change the pressure of the heat transfer medium supplied in accordance with each of multiple steps of the plasma process; and

the controller is configured to set the pressure of the heat transfer medium to a non-zero to a non-zero level during conveying of the object into and out of said chamber so as to carry out cooling of said focus ring during conveying the object to be processed into and out of said chamber.

Nishikawa teach a plasma apparatus comprising a processing chamber 2 that includes a mounting stage 5, an electrostatic chuck 17 and a focus ring 11 and wherein a substrate W is processed. Nishikawa et al further teach a heat transfer gas supply unit 15 and a nitrogen gas supply unit 16 (heat transfer gas), and a temperature adjustment unit 27 including a temperature controller, for supplying heat transfer gas/nitrogen between the electrostatic chuck and the substrate through a plurality of radially arranged heat transfer gas supply holes 14. Nishikawa also teach that the apparatus is configured so that it controls to enable supply of heat transfer gas through supply holes 14, during the time a wafer is carried out of the chamber after processing and a new wafer to be processed is carried in the chamber (that is the controller controls the pressure of heat transfer gas during multiple steps of processing and that the pressure of the heat

transfer gas is set to a non-zero level during conveying in/out of the wafer) {e.g. Figs. 5-9 and para. 0051-0094}. Though Nihikawa does not explicitly teach the heat transfer gas supply and pressure is controlled at the contact surface, it would be obvious to control the supply of heat transfer gas to the contact surface during process steps, and keep the pressure of the heat transfer gas to non-zero during conveying in/out of the wafer in the apparatus of Koshiishi et al in view of Masuda et al, in view of teaching of Nishikawa et al to control temperature of the focus ring and avoid workpiece contamination.

Therefore it would have been obvious to one of ordinary skills in the art at the time of the invention to to control the supply of heat transfer gas to the contact surface during process steps, and keep the pressure of the heat transfer gas to non-zero during conveying in/out of the wafer as taught by Nishikawa in the apparatus of Koshiishi et al in view of Masuda et al to control the supply of activated gas to the process chamber or to control temperature of the focus ring and avoid workpiece contamination.

Regarding Claim 15: Masuda et al teach the grooves 136 comprise annular shape concentric with the focus ring 132 [Fig. 2].

Regarding Claim 18: Koshiishi et al teach an electrode 11b built into the chuck device that faces the focus ring 12 (Fig.).

Regarding Claims 19, 20: Claim limitations reciting heat exchange means reducing temperature of focus ring to at least 20 degrees C below a temperature of the electrostatic chuck, and to a temperature not more than 0 degrees C are functional limitations, and since the apparatus of prior art meets the structural limitations of the claim, the same is considered capable of meeting the functional limitations (relevant case law already cited above under claim 8).

Regarding claim 28: Claim limitation "the supply path is evacuated when reducing a pressure inside said chamber" is a functional limitation and since the apparatus of prior art meets the structural limitations of the claim, the same is considered capable of meeting the functional limitation (relevant case law already cited above under claim 8).

Regarding Claim 29: Claim limitation "wherein the pressure of the heat transfer gas is increased in accordance with incrementing of the chuck voltage during the process sequence" is a functional limitation and since the apparatus of prior art meets the structural limitations of the claim, the same is considered capable of meeting the functional limitation (Relevant case law already cited above under claim 8).

Claims 13, 14 are rejected under 35 U.S.C. 103(a) as being unpatentable over Koshiishi et al (US PGPUB No. 2003/0106647) in view of Masuda et al (US 2002/0005252) and Nishikawa (WO 02/065532 – corresponding to USPGPUB 2004/0099635, which is referred to hereunder) as applied to claims 8, 15, 18-20, 28 and 29 and further in view of Kanno et al (US 6,373,681).

Regarding Claim 13: Koshiishi et al in view of Masuda et al and Nishikawa teach all limitations of the claim except the groove has a depth not less than 0.1 mm.

Kanno et al teach a plasma apparatus comprising an electrostatic chuck for supporting a wafer and where the electrostatic chuck has plurality of concentric grooves 46 provided on its top surface, for flowing a heat transfer gas between the wafer and the top surface of the electrostatic chuck. Kanno et al teach the depth of groove is 0.3 mm (meets the claim limitation of not less than 0.1 mm) [e.g. Fig. 14 and col. 17, line 60 to col. 18, line 40].

Therefore it would have been obvious to one of ordinary skills in the art at the time of the invention to provide the electrostatic chuck with groove at the contact surface as taught by Kanno et al in the apparatus of Koshiishi et al in view of Masuda et al and Nishikawa to enable flow heat transfer gas and control temperature of the focus ring and the wafer.

Regarding Claim 14: Kanno et al teach the gas groove is formed in such a shape that a heat transfer gas for promoting cooling of a wafer during processing effectively flows over the entire back surface of the wafer and the groove pattern is capable of giving a desired temperature distribution to the wafer during processing (col. 18, lines 18 -45). It would be obvious to optimize the shape of the groove as per process limitations like to effectively flow the heat transfer gas over the entire back surface of the wafer and giving a desired temperature distribution to the wafer during processing. In this connection the courts have ruled:

In this connection the courts have ruled:

It is well settled that determination of optimum values of cause effective variables such as these process parameters is within the skill of one practicing in the art. *In re Boesch*, 205 USPQ 215 (CCPA 1980).

Claim 21 is rejected under 35 U.S.C. 103(a) as being unpatentable over Koshiishi et al (US PGPUB No. 2003/0106647) in view of Masuda et al (US 2002/0005252) and Nishikawa (WO 02/065532 – corresponding to USPGPUB 2004/0099635, which is referred to hereunder) as applied to Claims 8, 15, 18-20, 28 and 29 and further in view of Huang (US 2004/0005726).

Regarding Claim 21: Koshiishi et al in view of Masuda et al and Nishikawa teach all limitations of the claim except that heat exchange medium comprises heating means for heating the focus ring.

Huang teach an apparatus that includes an electrostatic chuck 16 with a temperature controlled focus ring 52 having heat transfer means 54. Huang further teach that the apparatus comprises heat transfer means that can heat the focus ring (e.g. Fig. 3 and para. 0041).

Therefore it would have been obvious to one of ordinary skill in the art at the time of the invention to provide heating mean for heating the focus ring using as taught by Huang in the apparatus of Koshiishi et al in view of Masuda et al and Nishikawa to enable control the temperature of the focus ring and control plasma density at the edge of the substrate s per process limitations like amount of radicals to be adsorbed by the focus ring (para. 0042).

Claim 30 is rejected under 35 U.S.C. 103(a) as being unpatentable over Koshiishi et al (US PGPUB No. 2003/0106647) in view of Masuda et al (US 2002/0005252) and Nishikawa (WO 02/065532 – corresponding to USPGPUB 2004/0099635, which is referred to hereunder) as applied to Claims 8, 15, 18-20, 28, 29 and further in view of Hasegawa et al (US 5,556,500).

Regarding Claim 30: Koshiishi et al in view of Masuda et al and Nishikawa teach all limitations of the claim except a heating member in contact with said focus ring and covering at least an outer peripheral surface of said focus ring.

Hasegawa et al teach a plasma apparatus with a processing chamber 12 that includes a focus ring 114 and a heating member 116 in contact with outer peripheral surface of the focus ring 114. Hasegawa et al also teach a cylindrical body 124 that surrounds the focus ring 114 and also control the heating of focus ring 114 (e.g. Figs. 6, 7 and col. 9, line 52 to col. 10, line 14). Hasegawa et al does not explicitly teach that heating member 116 covers the outer peripheral

surface of focus ring, but teaches that shape of the same is optimized to reduce the deposition of reaction products on the individual parts like focus ring etc.

Therefore it would have been obvious to one of ordinary skill in the art at the time of the invention to provide a heating member in contact with focus ring and whose shape is optimized as taught by Hasegawa et al in the apparatus of Koshiishi et al in view of Masuda et al and Nishikawa to enable control the temperature of the focus ring and minimize the deposition of reaction products on the focus ring.

In this regard courts have ruled:

It is well settled that determination of optimum values of cause effective variables such as these process parameters is within the skill of one practicing in the art. *In re Boesch*, 205 USPQ 215 (CCPA 1980).

Claim 31, 32 are rejected under 35 U.S.C. 103(a) as being unpatentable over Koshiishi et al (US PGPUB No. 2003/0106647) in view of Masuda et al (US 2002/0005252) and Nishikawa (WO 02/065532 – corresponding to USPGPUB 2004/0099635, which is referred to hereunder) as applied to Claims 8, 15, 18-20, 28, 29 and further in view of Birang et al (US 5,491,603).

Regarding Claims 31, 32: Koshiishi et al in view of Masuda et al and Nishikawa teach all limitations of the claim except the controller is configured to control the chuck voltage to maintain a same polarity during the at least one processing sequence as during conveying the object from the chamber, and the controller is configured to control the chuck voltage to a first non-zero level during processing and configured to control the chuck voltage to a second non-zero level during conveying of the object into and out of said chamber.

Birang et al teach a plasma apparatus comprising a heat exchange gas system for an electrostatic chuck that includes a pressure transducer 240, a flow controller 230 and a controller 250. Birang et al further teach that the controller 250 enables control of chucking/dechucking voltage applied to electrostatic chuck. Birang et al also teach that a positive voltage of 2000V (non-zero voltage) is applied to electrostatic chuck during wafer's conveyance (before the wafer is place on the chuck (that is during conveyance of the wafer) and further during processing also a positive voltage (non-zero voltage) is applied for chucking (since the wafer bias adds to the chucking voltage) [e.g. Fig. 2 and col. 3, lines 35-65].

Therefore it would have been obvious to one of ordinary skill in the art at the time of the invention to configure the controller to control the chuck voltage to maintain a same polarity during the at least one processing sequence as during conveying the object from the chamber and apply non-zero voltages during the conveyance of wafer and during wafer processing as taught by Birang et al in the apparatus of Koshiishi et al in view of Masuda et al and Nishikawa to obtain effective chucking of wafer to the substrate during processing.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to RAKESH K. DHINGRA whose telephone number is (571)272-5959. The examiner can normally be reached on 8:30 -6:00 (Monday - Friday).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Parviz Hassanzadeh can be reached on (571)-272-1435. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/R. K. D./
Examiner, Art Unit 1792

/Karla Moore/
Primary Examiner, Art Unit 1792